

Construction Engineering

Department Information

- **Department Web Site:**
www.ndsu.edu/ccee/ (<http://www.ndsu.edu/ccee/>)
- **Credential Offered:**
B.S.Cons.E.
- **Official Program Curriculum:**
catalog.ndsu.edu/undergraduate/program-curriculum/construction-engineering/ (<http://catalog.ndsu.edu/undergraduate/program-curriculum/construction-engineering/>)

Construction Engineering is one of the four undergraduate programs in the Department of Civil, Construction and Environmental Engineering. The vision of the department is to impact people and communities through creation of globally relevant knowledge, innovators and future opportunity builders. We dare to change the world: we educate students to become global leaders in our field; we solve existing and emerging challenges of the world through innovation and research excellence; we integrate the complexities of design, management, and practice to solve societal problems and create opportunities; and we serve all people and communities in North Dakota and beyond.

The construction industry is one of the largest industries in the United States. It accounts for nearly 8 percent of the nation's gross national product and employs millions of people. The industry is divided into four sectors: residential building construction, industrial construction, commercial building construction, and heavy civil construction. The Construction Engineering program prepares nationally competitive students for successful careers in the construction industry.

THE PROGRAM

Construction Engineering involves the planning, design, and management of construction facilities, such as highways, bridges, airports, railroads, buildings, dams, and reservoirs. The construction of such projects requires the knowledge of engineering, management, economics, and business. Construction Engineering is differentiated from Construction Management from the standpoint of the use of math, science, and engineering to design projects and processes and analyze problems. Construction Engineering is involved in a variety of construction disciplines, including: commercial, residential, transportation, and infrastructure systems. Construction Engineers are also involved in the engineering design of temporary structures, cost estimating, planning and scheduling, material procurement, selection of equipment, and cost control. Due to their diverse skills, there is a very high demand for Construction Engineers.

The Bachelor of Science in Construction Engineering degree offers a blend of engineering and construction courses. The program is designed for those who want to work in the construction industry and become prepared for licensure as a professional engineer. A thorough knowledge of the physical sciences, math, and engineering is developed during the first two years followed by construction management and engineering courses. The technical side of the program is balanced with requirements in writing, humanities, social science, and communications. The Bachelor of Science in Construction Engineering program is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org> (<https://www.abet.org/>), under the General Criteria and the Construction and Similarly Named Engineering Programs Program Criteria.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

Graduates from the Bachelor of Science in Construction Engineering program are expected within the first few years after graduation to:

1. Engage successfully in the practice of construction engineering to solve current and emerging problems.
2. Integrate ethical considerations, diverse perspectives, and an awareness of the broader societal and sustainability implications into design and decision-making processes.
3. Begin to serve in mid-level project leadership roles in their construction engineering career.
4. Advance their profession through collaborative work, obtaining professional licensure, pursuing advanced degrees, and continuously acquiring new knowledge, while providing service to the community.

STUDENT OUTCOMES (SO)

The Program Educational Objectives are further connected to seven Student Outcomes (SO), developed by the Engineering Accreditation Commission of ABET, which describe what students are expected to know and be able to do by the time of graduation. These outcomes relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program. The Student Outcomes are listed below:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

CURRICULUM

First year construction engineering students at NDSU begin their education with fundamental courses in English, chemistry, math and an introduction to the engineering and construction sciences. Second year courses become more specific with an emphasis in surveying, math, physics and engineering and construction science courses. Third year courses reflect the key areas of construction engineering and management. The senior year continues key construction courses but also provides for 12 hours of technical electives and a senior design project as well as a business law course.

4+1 PROGRAMS

Option 1: the BSConE + MCM (4+1) program provides the opportunities for current students in the Construction Engineering program to pursue the Master of Construction Management (MCM) offered by the department. Students in the Construction Engineering program have an option to obtain a Master's degree through the 4+1 accelerated BSConE + MCM program, which requires at least a total of 30 semester credits. Up to 9 credits (three courses) from the Construction Engineering BS program can be double counted to the MCM program. However, these courses must be taken at the 600 or 700 level. The interested students can accelerate the master's study by reducing three courses, so they could complete the remaining 21 credits plus a professional exam and graduate in one year.

A separate application to the 4+1 programs is required. Applicants could apply their admissions at their junior year (having accumulated more than 60 credits) with an average accumulative GPA above 3.5. The review procedure for applications will follow the existing policy of master's graduate student admissions.

Application procedure:

- Interested and eligible students must submit a Combined/Accelerated Program Degree Program Declaration (<https://www.ndsu.edu/fileadmin/facultysenate/ucc/accelerated-programs.pdf>) form to the department office.
- Next, the student's academic advisor will evaluate the substitution of the graduate level courses into the undergraduate program, followed by the final review and approval from the Department Chair. A maximum of 9 graduate student credits* may be applied to the undergraduate degree.
- After receiving the necessary approvals noted above, the student will submit this form to the Graduate College and formally apply for admission to the graduate program.
- All admissions to the Graduate College will be conditional. The minimum condition is completion of the bachelor's degree prior to full standing in master's program, and maintaining a 3.0 cumulative GPA in their graduate classes.
- No undergraduate course may be counted toward a master's degree.
- Students entering the master's degree with a bachelor's degree in hand may not use courses earned as part of the bachelor's program for master's requirements, even if those courses were graduate level courses.
- Students must meet all of the requirements that would ordinarily be expected of those enrolled in the MCM program.

The graduate-level courses** that can be taken:

- CM&E 605: Construction Support Operations (instead of CM&E 405: Construction Support Operations)
- CM&E 603: Scheduling and Project Control (instead of CM&E 403: Scheduling and Project Control)
- CM&E 715: Construction Specifications and Contracts (instead of CM&E 315: Specifications and Contracts)

* Graduate tuition will be assessed for graduate credits approved for double-counting toward requirements for both undergraduate and graduate programs of study. Double-counted graduate credits count toward totals for financial aid, but are not covered under the tuition cap.

** Note: A substitution form is required for the 600/700-level courses to officially apply to the BS degree. This is submitted after they have enrolled in the class(es).

Option 2: students in the Construction Engineering program have an option to obtain a Master's degree through the 4+1 accelerated BSCE or BSConE + MSCE program, which requires at least a total of 24 semester credits and 6 master's thesis credits. Up to 9 credits (three courses) from the Construction Engineering BS program can be double counted to the MS program in Civil Engineering. However, these courses must be taken in the 600 or 700 level. In that sense, the interested students could accelerate the master's study by reducing three courses, so that they could complete the remaining 15 credits plus the completion of the master's thesis and graduate in one year.

A separate application to the 4+1 program is required. Applicants could apply their admissions at their junior year (having accumulated more than 75 credits) with an average accumulative GPA above 3.5. The review procedure for applications will follow the existing policy of master's graduate student admissions.

FACULTY

The Department has well-qualified and dedicated faculty. They are nationally and internationally recognized experts, with the knowledge and experience to prepare graduates for successful careers. All faculty members in the department have a doctoral degree. Many of them are licensed as a Professional Engineer (PE) or Certified Professional Constructor (CPC). In addition, the department has many adjunct faculty members who worked or are currently working in the industry.

FACILITIES

The department has excellent laboratory facilities for undergraduate education across all civil, environmental, and construction areas, including the teaching laboratories for civil engineering materials, construction management and engineering, environmental engineering, geotechnical engineering, structural engineering, transportation engineering, and water resources engineering. Students also have access to computer clusters and many state-of-the-art research laboratories. The program has the most updated modern teaching and research equipment such as GPS units, robotic total stations, drones, and VR units.

STUDENT ORGANIZATIONS

Students participate in many professional departmental student organizations in the department, which helps them develop leadership and teamwork skills. The major student organizations include: American Railway Engineering and Maintenance-of-Way Association (AREMA), American Society of Civil Engineers (ASCE), American Water Works Association (AWWA), Associated General Contractors (AGC), Institute of Transportation Engineers (ITE), Materials Research Society (MRS), National Association of Homebuilders (NAHB), Sigma Lambda Chi, and Water Environment Federation (WEF), as well as Steel Bridge, Concrete Canoe, Associated Schools of Construction, and Residential Construction Management, GeoWall, and Quiz Bowl competition teams. Students may also participate in a number of student organizations within the College of Engineering, including American Indian Science and Engineering Society (AISES), Engineers Without Borders (EWB), Grand Challenge Scholars of NDSU, Habitat for Humanity, National Society of Black Engineers (NSBE), and Society of Women Engineers (SWE). The student organizations have won a number of national and regional awards.

PREPARATION

High school students who wish to prepare for some phase of engineering at the college level should attempt to complete the following high school credits: one unit of physics, four units of mathematics, and one unit of chemistry. Incoming freshmen prepared to enroll in calculus frequently complete their construction engineering degree in four years. Students who have studied two years of pre-engineering at another institution typically complete the construction engineering degree in two additional years.

SCHOLARSHIP AND FINANCIAL AID

The department awards numerous scholarships each year, which mostly range from \$500 to \$10,000. The AGC of North Dakota and the Fargo/Moorhead Home Builders Care Foundation (a charitable arm of the Home Builders Association of Fargo-Moorhead) offer annual scholarships to incoming freshman and outstanding existing students. In addition, many other scholarships, such as Cossette Construction Management and Engineering Scholarship, Excellence in Construction Safety Scholarship and Interstates Construction Management and Engineering Scholarship, are available to students. Students should check with the department for more information. Other forms of financial aid are available through the Office of Financial Aid and Scholarships.

CAREER OPPORTUNITIES

Construction engineering graduates are in high demand after graduation by contractors in all types of construction, from design-construction firms to large owners who have continuing construction projects. Positions available include field engineer, office engineer, project engineer, project controls engineer, superintendent and project manager. Starting salary has been between \$50,000 and \$80,000 in the recent years. Students from construction engineering find summer internships or employment in the construction industry.